GENERAL DESIGN MEMORANDUM

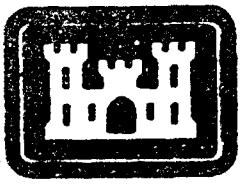
GULFPORT HARBOR

MISSISSIPPI

DESIGN MEMORANDUM NO. 1

APPENDIX A

ECONOMIC ANALYSIS



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This report contains a detailed economic analysis for channel improvements at Gulfport Harbor.

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GENERAL DESIGN MEMORANDUM

GULFPORT HARBOR, MISSISSIPPI

APPENDIX A

ECONOMIC ANALYSIS

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INTRODUCTION

In 1976, a feasibility report by the Mobile District Office (MDO)[1] established that this channel could be economically, environmentally and engineeringly improved to a 36'x300' channel. This analysis presents updated transportation savings associated with these channel improvements.

DEMOGRAPHY

General. Since this port is owned by the State of Mississippi, benefits from a deeper channel and the economic impact of port operations extends to the people of Mississippi. Three coastal counties (Hancock, Harrison and Jackson) would directly benefit since employment at the port is pulled from these counties. The port is located in Harrison County, in which most of its employees live. Population, housing and economies of these four entities shall be described herein.

Population. The three coastal counties have grown three times as fast as the state as a whole (see Table 1). Jackson County has grown the fastest, almost twice the rate of growth of Harrison County and almost triple the rate of Hancock County. Commercial and Industrial development and coastal amenities (beaches/ recreational) have been the major strengths and attractiveness of the coastal counties.

Housing Characteristics. The housing stock of the coastal counties has increased 209 percent from 1960 to 1980, which is a 40 percent faster housing stock increase than the State of Mississippi (Table 2). Housing occupancy rates in the three coastal counties was about 91 percent during this period. The two primary reasons for the housing stock to increase faster than population growth are: 1) gradually decreasing family sizes, and 2) increasing numbers of single person households.

Incomes and Employment. Table 3 shows that Harrison County enjoys the greatest per capita income of the three counties which is earned mainly from wholesale/retail trade, government and professional employment. Jackson County has the second highest per capita income from mainly Ingalls Shipbuilding and large industrial employers in Bayou Casotte Industrial Complex. Although Jackson and Harrison counties' per capita incomes are greater than that of the state, they are 20 and 25 percent, respectively, less than the per capita income of the region and country.

Summary. The economy of the study area is growing. The three county area has expanded in both population and per capita income, which are direct results of increase in jobs and incomes from all sources (manufacturing wholesale/retail trade, government and other).

TABLE 1
Study Area and State Population[2]
1940-1980

County	1940	1950	1960	1970	1980	% Growth (1940-1980)
Jackson	20,604	31,401	55,522	87,975	118,015	573
Harrison	50,799	84,073	119,489	134,582	157,665	310
Hancock	11,325	11,891	14,039	17,387	24,537	217
Total	82,728	127,365	189,050	239,944	300,217	363
MS.	2,183,781	2,178,914	2,217,141	2,216,944	2,520,638	116

TABLE 2
Study Area Housing Units[3]
1960-1980

County	1960	1970	1980	% Growth (1960-1980)
Jackson	15,695	27,584	42,635	272
Harrison	34,112	41,541	57,954	170
Hancock	4,332	7,330	12,537	289
Total	54,139	76,455	113,126	209
MS.	613,255	699,178	911,627	149

TABLE 3
Study Area Employment and Per Capita Incomes, 1983[4]

County	EMPLOYMENT (%)					Per Capita Incomes ($)
	Manufacturing	Wholesale/Ret	Professional	Government	Other a/	
Jackson	34	19	16	18	13	7,756
Harrison	12	23	21	25	19	8,205
Hancock	15	19	19	22	25	6,077
Mississippi	25	19	20	21	15	7,409
The South	21	20	19	19	21	9,582
U.S.A.	22	20	20	17	21	10,495

[a]Includes self-employment, farming, and construction, etc.

BENEFIT METHODOLOGY

Transportation benefits associated with a deeper channel at Gulfport Harbor are generated by more efficient utilization (more fully loading) of vessels presently calling at the port, reduced vessel transit times and port times, and other benefit categories. Benefits were computed as the difference in transportation costs between the without-project condition and the with-project conditions. All future benefits are discounted to their present value and then amortized over the project life (1995-2045) at the FY 1990 interest rate (8-7/8%). Transportation costs/data were based upon Department of Army Economic Guidance Memorandum Number 89-5, dated 15 September 1989. (Vessel drafts and immersion factors were based on Department of Army Engineering Circular 1105-2-177, dated 24 July 1987.)

EXISTING COMMERCE

Table 4 displays the total tonnage at the Port of Gulfport for 1980-1986. Approximately 88 percent of the port's commerce is export or import trade and about 12 percent consists of coast-wide domestic shipments, with imports 53 percent greater than exports. A seven year average for commerce for the years 1980-1986 amounted to 1,244,622 tons. In the 1976 feasibility report, the 10-year average for 1965-1974 amounted to 850,080 tons.[5] There was an almost continual increase in traffic at the port until 1986, which was a depressed year for shipping in the whole U.S.

The principal foreign products moving in deep draft vessels under existing conditions include imported containerized fresh and canned fruits with a backhaul of paper and paperboard, dually imported ilmenite ore and containers with a backhaul of containers; and exported and imported miscellaneous products in containers. This port's first container operations started in 1973 with containerized fruit. By 1986, 50 percent of the port's tonnage was containerized. (The first 35-ton container crane was made operational in 1977 and the second, a 34-ton crane, was added in 1986 to substantially increase the port's operational capabilities.) Table 5 displays the major commodities and their average tonnages which were imported or exported through the port during 1985 and 1986. (The data in Table 5 will not match the data in Table 4 since only the major exports and imports are displayed in Table 5.)

TRIBUTARY AREA OF THE PORT

The Port of Gulfport serves the container trade over approximately an 800-mile radius hinterland (see Plate A-1 at the end of this appendix). This tributary area is essentially the same service area as the ports of Mobile and New Orleans.

TABLE 4
Gulfport Harbor, MS Annual Commerce, 1980-1986[6]
(Short tons)

	Total	Foreign		Domestic Receipts Shipments
		Imports	Exports	
1980	1,241,808	726,848	437,407	77,553
1981	1,120,102	729,390	311,806	78,906
1982	1,195,912	789,204	335,870	70,838
1983	1,147,970	726,910	312,330	108,730
1984	1,360,941	743,374	444,583	172,984
1985	1,432,639	835,555	348,334	248,750
1986	1,212,982	723,831	238,694	250,457
7-Year Average	1,244,622	753,587	347,003	144,031

TABLE 5
Major Existing Deep Draft Foreign Commerce - Port of Gulfport
1985-1986 Average (Rounded)

Commodity	Average of 1985-1986 (Rounded) Imports (tons)	Exports (tons)	Total (tons)
Containers:			
Bananas	370,000		370,000
Canned Fruit	28,000		28,000
General Cargo	70,000	80,000	150,000
Ilmenite Ore (bulk)	174,000		174,000[a]
Bananas (break bulk)	80,000		80,000[b]
Paper/Paperboard (break bulk)		127,000	127,000
Animal Feeds (bulk)	27,500		27,500
Totals	749,500	207,000	956,500

[a]Port unloading equipment was down for extensive repairs during first half of 1986; this would have been 196,400 short tons as the 1985-1986 average.
[b]These were containerized in March, 1987.

Gulfport Harbor is attractive to container shippers because of its shorter non-riverine channel and other amenities which will be discussed later. The American Association of Port Authorities Newsletter in May 1989 showed that Gulfport was the third leading container port in 1988 on the Gulf of Mexico behind Houston in first place and New Orleans in second place.

COMPARISON OF 1975 TO 1987 CONDITIONS

Port Operations. Since 1975, port operations have changed from breakbulk to container, and facilities have been modernized to accommodate containers.[7] Only two commodities remain at their 1975 base-year level--ilmenite ore and fresh fruit, but the fresh fruit is now containerized. Table 6 describes the major differences in commodities, vessel types, and operations, including a comparison of commodities and vessels which needed greater depths.

Vessel Operating Characteristics. As shown in Table 6, the kinds and sizes of vessels needing greater channel depths remain about the same. Ilmenite ore now moves in bulk carriers which have been modified to carry containers also. Fresh fruit was transported on general cargo vessels drawing approximately 24 feet in 1975. Now all fruit, fresh and canned, is transported in containers. In 1975 a vessel underkeel clearance of 4 feet was used. For 1987, underkeel clearances were based upon actual operations, which resulted in no underkeel clearance requirement for many of the vessels. However, container and Roll-on Roll-off (RoRo) vessels require either 1 or 2 feet underkeel clearance depending on the amount of freeboard on the vessel which is caused from repositioning of empty containers between ports. Specifically, the more freeboard, the more underkeel clearance required for maneuverability. These underkeel clearances were provided by company officials.

BASE YEAR COMMERCE

General. "Base Year" is the first year a project is expected to be fully operational. The level of commerce (kind and tonnage) must be established for the base year of a proposed project, which is 1995 for Gulfport. (The level of commerce for the period 1995-2045 will be covered in the following section called "Without-Project Condition.") Operational characteristics of all existing and potential users of the port were ascertained from field survey by MDO personnel.

Traffic Surveys. During the course of this analysis, 60 firms and other interests were interviewed to determine existing and future commerce patterns and vessel needs at the Port of Gulfport. These are:

TABLE 6

Comparative Analysis of Commodities, Tonnages and Vessels Needing a Deeper Channel at Port of Gulfport (1976 and 1987)

	TONS					
	1976 REPORT			1987 REPORT		
	1975	WITH-PROJECT		1986	WITH-PROJECT	
COMMODITY	EXISTING CONDITION	1984 (YEAR 1)	2033 (YEAR 50)	EXISTING CONDITION	1995 (YEAR 1)	2045 (YEAR 50)
Iron and Steel Plates	44,000	180,000	759,000	0	0	0
Fertilizer & Fertilizer Materials	67,000	67,000	67,000	27,500	42,300	83,600
Ilmenite Ore	0	277,000	504,000	174,000	379,100	749,200
Iron & Steel Scrap	30,000	36,000	85,000	0[a]	365,300[a]	1,016,200[a]
Fresh/Canned Fruit (containers)	0	0	0	369,700	390,800	772,400
General (containers)	0	0	0	150,000	181,700	359,200

	KIND, SIZE AND DRAFT VESSELS	
	1976 REPORT	1987 REPORT[b]
Iron & Steel Plates	35,000 dwt DBC with 36 draft & 4' U/K clearance	N/A
Fertilizer & Fertilizer Materials	21,000 dwt GC with 36' draft & 4' U/K clearance	35,000 DBC with 36' draft & "0" U/K clearance
Ilmenite Ore	35,000 dwt DBC with 36' draft & 4' U/K clearance	42,000 C/BC with 37.4' draft & "0" U/K clearance
Iron & Steel Scrap	25-35,000 dwt DBC with 36' draft & 4' U/K clearance	35,000 DBC with 36' draft & "0" U/K clearance
Fresh/Canned Fruit (containers)	N/A	13,320 dwt container ship with 30' draft & 2' U/K clearance
General (containers)	N/A	22,000 dwt RoRo's & container with 35'/33' drafts & 2'/1'U/K clearances, respectively

[a]This Gulfport company operated out of this channel in 1976, but is presently barging 224,000 tons and railing 112,000 tons of scrap from Gulfport to New Orleans and shipping via 35,000 dwt dry bulk carriers because of lack of channel depth at Gulfport.

[b]U/K clearance is based on existing operating practices

dwt = deadweight tonnage
DBC = dry bulk carrier
C/BC = Container/bulk carrier, or "conbulkers"
RoRo = Roll on/Roll of
U/K = underkeel
GC = general cargo
N/A = Not applicable

1. Gulfport Port Authority
2. Hapag - Lloyd Container Lines
3. Atlantic Container Lines
4. Columbus Lines
5. Lykes Lines
6. ACT/PACE Steamship Lines
7. Trans Freight Lines/NED-Lloyds[a]
8. Standard Fruit & Steamship Company
9. Deppe Steamship Lines
10. TMT Shipping and Chartering
11. Newman Lumber Company[a]
12. Baldwin Aircraft Company
13. Colonial Sugars-Borden, Inc.[a]
14. H. J. Baker & Bros, Inc.[a]
15. Ryan Walsh Stevedoring Company, Inc.[a]
16. Reynolds Metal Company
17. Legg Construction & Fabrication
18. Treated Wood Products, Inc.
19. Container General Corporation
20. Mandels, Inc.
21. Highside Chemicals, Inc.
22. Paceco, Inc.
23. Chemfax, Inc.
24. Reichhold Chemicals
25. Biloxi Pre-Stress Concrete
26. Lockheed Aircraft
27. Ce-Natco
28. Morton Thiokol, Inc.
29. Oceans International Corp.[a]
30. Klumb Lumber Co.
31. Struthers Wells
32. ABC Containerlines, Inc.[a]
33. United Brands Company[a]
34. E.I. DuPont de Nemours & Co.[a]
35. International Proteins Corporation[a]
36. Goldin Industries, Inc.[a]
37. U.S. Naval Oceanographic and Atmospheric Administration (NOAA)[a]
38. U.S. Customs (Gulfport, Mobile and New Orleans)
39. Compass Marine and Towing Company
40. Parker Towing Company
41. Port Bienville, MS
42. Merchants River Transport (New Orleans)
43. Atlantic & Gulf Stevedores, Inc.[a]
44. Ship Captain (Mr. Hubert Thomas), MV "Helen", ABC Containerlines, Inc.
45. Page & Jones, Inc.
46. Interoceans Steamship Agency
47. Mobile Ship Channelry
48. Gulfport Pilots Association[a]
49. Waterman Isthmian Lines[a]
50. Gulf Container Lines
51. U.S. Naval Construction Battalion (Gulfport), USN[a]

52. Military Traffic Management Command, Eastern Area, US Army
53. Marine Corps Logistics Battalion, Albany, GA, USMC
54. Naval Facilities Engineering Command, Southern Division, USN
55. NASA Rocket Engine Test Site, Bay St. Louis
56. Mississippi Army Ammunition Plant, Bay St. Louis, US Army
57. Army Munitions & Chemical Command, US Army
58. Deputy Asst. Secretary of the Navy, Sealift & Maritime Affairs, USN
59. Harrison County Development Authority
60. Ter-Chemical, Inc.[a]

[a]This firm or facility would benefit from a deeper channel.

Base Year Commerce, Tonnage, and Operations (1992). Deep-draft traffic currently engaged in foreign trade was analyzed to establish a base for the identification of movements which would be beneficially affected by the considered channel improvements at the Port of Gulfport. The conduct of these investigations and the rationale for accepting various commodities as base year commerce are explained in subsequent paragraphs.

a. Fresh and Canned Fruit (imports). United Brands Company presently imports 369,700 tons of fruit from Puerto Cortez, Honduras, annually. A committed container vessel (486'x84'x24') now arrives every 6 days. By 1995, three new, committed container vessels (586'x110'x30', needing a 2-foot underkeel clearance) will be carrying fruit into Gulfport every 6 days. (These vessels were on order in 1987 based on information from company officials and estimated construction will be completed by 1995.) The tonnage for Gulfport will have grown to 390,800 tons by 1995. These vessels will have a 100 percent empty "backhaul" rate back to Honduras). This traffic would benefit from a deeper channel and was accepted as base year tonnage under without-project conditions.

Standard Fruit and Steamship Company annually imports 80,000 tons of fresh and canned fruits from four South and Central American ports. Their container vessel (409'x66'x25') arrives weekly. Previously, this traffic was break bulk on general cargo vessels, but their container operations started in March 1987. This company has two new container vessels in service which draw 34 feet, but at present they do not call at Gulfport. According to company officials, this traffic will not change to Gulfport in the near future and, therefore, it was not included as base year tonnage.

b. Scrap Metal (export). Goldin Industries, Inc., a Gulfport firm located on the upper end of the Federal shallow

draft channel for Biloxi Harbor, was moving scrap steel through this harbor in the 1976 report[8] and subsequently changed to the Port of New Orleans. The company is presently barging 224,000 tons annually to Darrow, Louisiana (and railing another 112,000 tons annually to Darrow) for export through the Port of New Orleans to Japan and Europe in 35,000 dwt dry bulk carriers. With a deeper channel this entire operation would move to Gulfport by 1995. This tonnage will have grown to 365,300 tons by 1995; these tons were accepted as base year tonnage for scrap metal.

c. Fishmeal (import). During 1986, International Proteins Corporation imported 27,500 tons of bulk fishmeal (a fertilizer or pet food raw material) into Gulfport from Chile. Traffic was in general cargo or small dry bulk carriers which were lightloaded to meet the 30' draft restrictions at Gulfport. This tonnage will have grown to 42,300 tons by 1995; these tons were used as the base year tonnage for fishmeal.

d. Ilmenite Ore (import). E. I. DuPont de Nemours & Co. operates a 246,400 ton capacity titanium dioxide pigment plant at DeLisle, Mississippi, 15 miles northwest of Gulfport, which was described in the 1976 report.[9] On the average, this plant imports 196,400 tons of ore annually from Australia on modified dry bulk carriers called "conbulkers," which carry 1100-1300 containers in addition to bulk commodities. ABC Containerlines of Belgium has a long-term charter to deliver this ore to Gulfport Harbor in six committed 42,000 dwt conbulkers (3 draw 38 feet and 3 draw 36.5 feet). A 30-percent plant expansion is currently under construction, and will be completed by 1989 (an additional 112,000 short tons of ore will be needed for the expansion). Each of these shipments will have grown to 204,800 and 116,800 tons, respectively, by 1995; these latter tons were accepted as base year tonnage under without-project Condition.

e. Containerized General Cargo (import/export). During 1985 and 1986, an average of 150,000 tons of containerized cargo was either imported or exported, mainly by Trans Freight Lines (TFL), a container line which operated a weekly service between Europe, the East Coast, and the Gulf Coast. Gulfport and Galveston, Texas, were the two Gulf ports in this feeder service. Originally a committed container fleet of six vessels (3 vessels drafting 33 feet and 3 vessels drafting 30 feet) was used in this feeder service and rarely were these vessels loaded to the existing channel depth. In September, 1986, a joint venture between TFL and Nedlloyd Lijnen Lines, a Rotterdam shipping line, changed the weekly service to a fleet of five vessels--two RoRo's drafting 35 feet each and three container ships of which two drafted 30 feet and one drafted 33 feet). All five vessels lightloaded during 1986 and 1987.

In early 1988, this company (TFL) diverted this general container traffic to New Orleans since one of their RoRo vessels ran aground while maneuvering the most northern "dog leg" in the Horn Island Pass. Port officials at Gulfport Harbor were confident that this loss of general container traffic was temporary; specifically other general container traffic would be enticed to the port with the expansion of their container yards (27.4 acres) in the early 1990's. This tonnage will have grown to 181,700 tons of general cargo; however, this tonnage was not accepted as base year tonnage under without-project condition.

ABC Containerlines imports approximately 5,500 tons of containerized general cargo into Gulfport annually along with the bulk ilmenite ore from Australia. These same vessels imported 3000 containers annually into New Orleans during 1985 and 1986, or 60,000 tons annually. The major reason these vessels call at New Orleans is to offload enough cargo to call at Gulfport. With a deeper channel this cargo would be shifted to Gulfport in order to avoid the long vessel transit times and greater port handling charges at New Orleans.[10] This latter tonnage was not accepted as base year tonnage. Instead, the transfer of these containers was treated as "induced benefits."

f. Military Cargoes and Ships. Numerous existing and potential military users were interviewed for possibly using the channel in larger or more fully loaded vessels. The US Naval Oceanographic Center located at Bay St. Louis, Mississippi, brings three hydrographic sonar ships drawing 32.3 feet (including sonar equipment on the ship's bottoms) into New Orleans for resupply and crew liberty 1.5 times per vessel annually. These vessels would shift to Gulfport with the availability of a 34-foot channel for safety of the sonar equipment on bottom (silty bottom at Gulfport vs. floating objects at New Orleans) and safety of its crew (Gulfport Harbor can be totally secured and their military pier at New Orleans cannot). Several of their smaller hydrographic vessels presently call at Gulfport (resupply and crew changes) on a regular basis.

The Naval Construction Battalion, located 1/4 mile from the port, annually trucks and rails approximately 25,000 tons of military equipment to Norfolk, New Orleans, or Jacksonville for aggregation into larger shiploads to foreign destinations. (During wartime this supply facility would be expected to ship over 200,000 tons annually to foreign destinations.) However, the Military Traffic Management Command (MTMC), which centralizes the routing of U.S. military cargoes, feels that the Port of Gulfport has no advantage over adjacent coastal ports (i.e., Mobile or New Orleans) for military shipments. Therefore, no export military cargoes could be claimed in this analysis.

Summary of Base Year Commerce and Tonnages. Table 7 displays the summary of types of commerce and tonnages which will be either imported or exported through the Port of Gulfport in deep-draft vessels under without project conditions and which would benefit from a channel depth greater than 30 feet.

TABLE 7
Summary of Without-Project Commerce and Tonnages at Gulfport in 1995 (Base Year)

Commodity	Tonnages
Fresh and Canned Fruits (Imports)	390,800
Scrap Metal (Export)	0[a]
Fishmeal (Import)	42,300
Ilmenite Ore (Import)	321,600
Containerized General Cargo (Export/Import)	0[b]
US Naval Oceanographic Vessels	[c]
Total	754,700

[a]This tonnage will remain at New Orleans without the project.

[b]These containers (150,000 tons) were using Gulfport up to 1986, but shifted to Mobile in 1988.

[c]No "tonnage" is claimed.

WITHOUT-PROJECT CONDITION

General. The without-project condition is the condition expected to exist at Gulfport in the absence of an improved channel. The purpose of this analysis is to explore possible changes in users' operational patterns over the without-project timeframe (1995-2045) and compare these operational patterns to with-project conditions. Any potential users of the channel must also be included in this analysis.

Changes in Vessel Operational Patterns. With the exception of the ilmenite ore, no major changes in vessel operating patterns are expected after the base year in vessel sizes or ports of origin or destination for port users. The mines in Australia

will have reduced production of ilmenite by 1995, and, therefore, one-half the base year tonnage will be imported from country B which has a port depth of 36 feet (MDO will maintain confidentiality of DuPont's source for this ore) in chartered 23,000 dwt dry bulk carriers drawing 34 feet.[11] The ore for the 30 percent plant expansion by 1995 will come from Country C, which has port depths greater than 36 feet, in chartered 35,000 dwt dry bulk carriers drawing 36 feet.[12] In both these cases, vessels would be fully loaded with a deeper channel available at Gulfport.

Projected Increases in Traffic. Comparing the base year (1984) tonnage from the 1976 report[13] to 1995 for this reanalysis, it was found that the total tonnage which would use a deeper channel increased 213 percent over the 10-year period between field surveys (1976 to 1986). Based upon import or export growth rates coupled with BEA earnings for each commodity herein for this region and/or relevant company data, the following projections of base year tonnages over the 50 year project life for each commodity are as follows: fresh fruit, 200%; scrap metal, 284%; fishmeal, 200%; ilmenite ore, 200%; and containerized general cargo, 200%. See subsequent paragraphs beginning on page A-24 for further discussions.

VESSEL TRAFFIC, CHARACTERISTICS AND COSTS

General. Based on the data in the 1976 Feasibility Report, the volume of vessel traffic (number of trips) decreased from the early 1970's; however, the percentage of vessels with drafts greater than 30 feet increased dramatically in this same period. As shown using 1985 port data in Table 8, much larger vessels called at the port.

TABLE 8
Vessel Traffic at Gulfport by Draft
for the Years 1976 and 1985

VESSEL WITH DRAFTS (feet)	NO. VESSELS 1976	1985
38	0	9
37	0	1
36	0	12
35	0	13
34	0	4
33	0	24
32	0	12
31	0	13
30	2	46
29	8	5
28	10	30
Less than 28	395[a]	212[a]
Total	415	381

[a]These numbers include deep and shallow-draft vessels.

Vessels with fully loaded drafts of 30 feet and greater were 35 percent of the total vessel trips in 1985 (as compared to less than one percent in 1974[14]. Almost 45 percent of the total vessel trips were in vessels with draft capacity of 28 feet and greater, a 40 percent increase over the 1974 totals. It should be noted that this table is displayed solely for the purpose of showing that the calling vessels are much larger in size. For perusal of the vessel sizes which will transport the commodities in this analysis, see Table 9.

Vessel Characteristics. Pertinent data on the general characteristics of vessels expected to make up the fleet calling at the Port of Gulfport under the "Without-Project" condition are presented in Table 9. Ilmenite ore will continue to move in 42,000 dwt conbulkers from Australia. Based on data received from Dupont officials, part of the ore for their plant will also move from two other ports in 23,000 dwt and 35,000 dwt dry bulk carriers during the proposed project life.

Fishmeal will move in 35,000 dwt dry bulk carriers also. Fruit will move in committed 13,320 dwt container vessels which are owned by United Brands Inc. General commodities will be exported or imported in containers on two committed Roll on/Roll off vessels and three committed container vessels of the 21,200 and 19,000 dwt sizes, respectively, by Trans Freight Lines or a

similar container company. All of these vessels will be foreign flag and all will be on a charter basis except for the vessels transporting fruit.

Vessel Operating Costs. Pertinent vessel operating costs based on FY1990 price levels were obtained from Department of Army Economic Guidance Memorandum 89-5, dated 15 September 1989. Operating costs are in terms of cost per hour for the operation of the vessels at sea and in port. That information is also shown in Table 9.

Hourly operating costs from Table 9 were applied to varying vessel operating procedures to determine net ton transportation costs. Consideration was given to such factors as distance of haul, speed of vessel, vessel size (dwt), amount of backhaul, and the allowable load of cargo under varying channel depths at Gulfport. Times in port were based upon port officials data or furnished by the Office of Chief of Engineers (OCE). Other costs developed for this study included consideration of accessory charges (port, vessel, and handling) at Gulfport and considered alternative ports. All costs were adjusted to reflect the cost per ton of cargo handled.

A voyage constitutes a one-way movement from Gulfport to the foreign port plus some part of the return trip to Gulfport (or another Gulf of Mexico port). In calculating at-sea costs, an allowance is made to reflect a partial empty return (backhaul) for dry bulk carriers only. Dry bulk carriers do not operate fully loaded at all times based on research by MDO for deepening other harbors in the district. These vessels operate about sixty percent of the time with cargo aboard. The other forty percent of the time they are empty. To compensate for being loaded sixty percent of the time, an eighty percent backhaul was assigned to all dry bulk carriers transporting ilmenite ore, scrap metal and fishmeal to/from Gulfport. Containerized fresh fruit was assigned a 100 percent empty backhaul based on company data. To simplify the calculation of total voyage costs, a factor of 1.8 was applied to the one-way mileage. This backhaul rate does not apply to container vessels or modified container/dry bulk carriers, which are both loading and unloading cargoes at each port usually in a world trip ("liner service"). No backhaul rates were applied in the 1976 Feasibility Report on Gulfport Harbor.

Unit transportation cost. Estimates of the operating costs per ton were computed for vessels fully loaded and light loaded using data from Table 9. The following computation illustrates the method used to determine ocean freight costs for the various movements considered. The unit costs were derived by dividing the total operating costs for a voyage for a particular vessel size by the volume of cargo that can be carried with increased channel depths.

TABLE 9
Characteristics and Hourly Operating Costs for Foreign Flag, Deep Draft Vessel[15]
Transporting Commerce at Gulfport Harbor
Under Without- and With-Project Conditions
1 October 1989 Prices

Commodity	VESSEL CHARACTERISTICS: Kind	Size (dwt)	Dimensions (feet)	Immersion Factor	Speed (Knots)	Payload Capacity[16]	Time In Port (Hrs)	OPERATING COSTS PER HOUR: At Sea	In Port	Operating Clearance
Ilmenite Ore	Conbulker	42,000[a]	686x100x37.4	1430	18	40,000	54	$953	$588	0
Ilmenite Ore	Bulk Carrier	23,000	548x74x33.3	974	14	23,613	36	507	364	0
Ilmenite Ore/ Scrap Metal/ Fishmeal	Bulk Carrier	35,000	653x96x36	1260	14	31,312	54	535	394	0
Fresh Fruit	Container	13,320	586x110x30	696	17	14,319	24[b]	544	389	2
General Containers[c]	RoRo	22,500[b]	720x95x35[c]	1356	20	24,192	24[b]	827	544	2
General Container[sc]	Container	21,200	675x92x33	1068	20	21,370	24[b]	843	543	1
General Containers[c]	Container	19,000	648x85x31	924	20	19,152	24[b]	807	519	1

[a]This is the largest vessel size calling at the port under existing condition; however by 1995 its percentage of total port calls will diminish and the 35,000 dwt dry bulk carrier will be the most prevalent size. For vessel costs, a 28,000 dwt container vessel was substituted based actual operational characteristics. Operational draft of this conbulker is 36 feet.

[b]Based upon advice from company officials, MDO used vessel costs for a 24,000 dwt container vessel as a proxy for the RoRo.

[c]"Operational draft" is 34 feet for these RoRo's in the Gulf of Mexico; for all other container vessels, maximum draft is fully utilized in this Gulf of Mexico feeder service.

SAMPLE COMPUTATION

Type Vessel = Dry Bulk Carrier; Deadweight tons = 35,000 tons
Time in Port (origin and destination)= 109 hours
Payload capacity = 35,280
Maximum draft = 36 feet
Cost per hour = $680 at sea; $426 in port
Immersion factor = 1,260 tons per foot of immersion
One-way distance = 11,000 nautical miles
Time at sea = 11,000 mi.x 1.8 (backhaul)/15 knots = 1,320 hours
Cost per roundtrip = ($680 x 1,320 hrs)+($426 x 109 hrs)=$944,034
Cost per ton lightloaded to 30 feet for a 30-foot channel:
$944,034 divided by [35,280 - (1,260 x 6)] = $34.06
Cost per ton fully loaded to 36 feet for a 36-foot channel:
$944,034 divided by 35,280 = $26.76

ALTERNATIVE TRANSPORTATION MODES AND COSTS

General. Various alternative modes of shipment were investigated to provide comparisons in evaluating transportation savings that would be realized from the proposed channel improvements at Gulfport. Consideration was given to alternative routings, different vessel sizes, allowable cargoes, and offloading cargo at alternative ports in determining savings. Subsequent paragraphs contain detailed descriptions of the alternative modes, cost, and unit savings for the various commodities identified as prospective commerce.

Ilmenite Ore (Import). Until 1995 DuPont has a long-term contract with ABC Containerlines of Belgium to deliver 246,400 tons of ore into Gulfport annually. There are six committed conbulkers in this fleet which average 42,000 dwt and draw 37.4 feet when fully loaded with ore (when fully loaded with containers, not as much ore can be loaded, thus the operational draft is 36 feet). These vessels load 18-24,000 tons of ore at Geraldton, Australia for a maximum draft of 29.5 feet and then top off with additional ore and/or 1100-1300 containers at other Australian and New Zealand ports to make the ocean trip fully loaded. Their first port of call is the New Orleans or Burnside Bulk Plants to offload ore and then to container terminals to offload containers for a total lightening of 11,200 tons to meet draft restrictions at Gulfport. The ore offloaded at New Orleans is bound for either DuPont's New Johnsonville, Tennessee or DeLisle (Gulfport) plants. (Based upon MDO field data obtained in 1986 for the Port Bienville feasibility study, 50,000 tons of ore is barged annually from either the New Orleans or Burnside Bulk Plants to Port Bienville destined for their Delisle plant. Delivery cost was $8.76 per ton including dual port handling charges and barge and truck costs to the DeLisle plant.) According to officials at ABC Containerlines, if a deeper channel were available, all ore for the Gulfport area and the 3,000 containers annually offloaded at New Orleans would be

shifted to Gulfport to avoid the extra vessel and handling costs at New Orleans. (Ore destined for New Johnsonville would continue to be delivered to New Orleans or Burnside.)

Alternative modes considered for this movement included: a) ocean transport to New Orleans and then move 246,400 tons by rail from the New Orleans/Burnside Bulk Plants to their DeLisle plant: b) same ocean leg and then move that 246,400 tons of ore by barge to Port Bienville and then by truck to their plant; c) ocean leg into New Orleans where 11,200 tons would be offloaded and 2500 tons of that same ore would be barged or trucked to their plant; move vessel to Gulfport and transport the remainder of the ore load (18,000 short tons) by rail to their plant; and d) ocean leg directly into Gulfport, lightloaded, and move by rail to plant.

These four alternative modes of transportation are compared in Table 10 (no backhaul rates were used since this is a "conbulker"). Alternative C is their present mode of operation; and as can be seen, it is the cheapest alternative (alternative D is not reasonable since the vessel would travel 11,170 miles lightloaded by 7.4 feet). Other alternative ports such as Pascagoula or Mobile were excluded from this analysis since the DeLisle plant is only 99 miles from Burnside and a little less from the New Orleans bulk plants respectively.

Fresh Fruits (Container/Import). Since this is a completely containerized (and refrigerated) operation, no inland alternative to truck transportation was considered in this analysis. The market area is the Southeastern United States, and trucking costs are approximately the same from Gulfport, New Orleans or Mobile to their ultimate destination. See Plate A-1 for a graphic illustration of the tributary area served by Gulfport. No other port is a viable alternative, since vessel charges at Gulfport are considerably less than Mobile and New Orleans. (See Table 11 for a sample cost comparison of port/harbor/channel transit charges of an 18,500 dwt container vessel). It should be noted that the data in Table 11 does not include cargo handling charges or vessel delays at these ports since both are unpredictable. (Stevedoring charges are confidential and subject to change daily; and therefore they are not included in this analysis.)

TABLE 10
Alternative Transportation Modes for Ilmenite Ore for Without-Project Condition
(1 October 1986 Prices)

Alternative Mode[a]	Per Ton Costs for a 30-foot Channel at Gulfport
A. Ocean to Burnside;[b]	$ 14.52
rail to Plant[c]	9.40
	23.92
B. Ocean to Burnside;[b]	14.52
barge to Port Bienville &	5.91
truck to Plant	2.85
	23.28
C. Ocean to Burnside;[b]	14.52
offload 2,500 s/t & barged/trucked as in "B"; and remainder,	8.76
ocean to Gulfport;	15.67
rail to Plant	6.29
	22.12[d]
D. Ocean to Gulfport;	19.54
rail to Plant	6.29
	$ 25.83

[a]A 42,000 dwt conbulker with 37.8-foot draft with no underkeel clearance was used, since these vessels are loading to 30' (and more) on the existing 30-foot channel at Gulfport.

[b]Channel depth at Burnside exceeds 36 feet, therefore the Burnside portion in alternatives C & D must be compared to a 40 foot channel at Burnside and a 30-foot channel at Gulfport.

[c]A truck rate of $12.20 per ton was not a viable alternative.

[d]The full ocean costs were proportioned by commodity (containers vs. ore) and distance for the average Gulfport ore which was offloaded at Burnside, so that there is no double counting. The answer is weighted, or, 2,500 tons x ($14.52 + $8.76)+ 18,000 tons x ($15.76+$6.29) = $453,480/20,500 tons = $22.12. This is the least cost alternative.

Note: Voyage costs in this table do not include backhaul rates since the vessel used here is a modified container/bulk carrier used in a world "liner" service.

TABLE 11
Comparison of Vessel Costs at
Gulfport, New Orleans and Mobile Harbor[a]
(18,500 dwt container vessel, 632'x87'x27.5')
(1 October 1986 $)

	Gulfport	New Orleans	Mobile
Pilots	$1,397	$ 2,461	$ 1,475
Tugs	1,000	2,100	1,102
Linesmen	200	250	200
Dockage (first 24 hours)	1,334	1,595	1,201
Harbor Fee	150	165	150
Vessel Operating Costs in Channel (entry + exit) ($996 per hour at sea)[b]	3,785	13,884[c]	7,131
Totals	$7,866	$20,455	$11,259

[a]Data furnished by the Port of Gulfport from a study conducted June, 1987, for American Container Lines' (ACL) "Finnhawk" which called at Gulfport.

[b]Vessel speeds were obtained from chief pilot at Gulfport, harbormaster at Mobile and the Corps of Engineers office at New Orleans. Vessel operating costs were obtained from EC 1105-2-167 dated 25 July 1986 (revised June 1987).

[c]This figure is based upon the vessel calling at the container terminals at the head of the Mississippi River Gulf Outlet. Had this vessel called at public terminals in the New Orleans harbor this figure would have been $18,426, or a total cost of $24,997.

Fishmeal (Import). Most of the fishmeal imported into Gulfport is used as chicken feed by poultry farmers in Southern Mississippi. A single truck load is the normal purchase by farmers; therefore, no other inland method of transportation was considered in this analysis. Nearby ports were not considered reasonable alternatives due to lesser vessel charges at Gulfport and the proximity of Gulfport Harbor to the final destinations of the fishmeal at southern Mississippi farms.

Containerized General Cargo (Export and Import). This container tonnage (150,000) was diverted to New Orleans in early 1988 due to inadequate channel depths and a hazardous pass channel at Gulfport. Even though Gulfport is the least costly port of these three neighboring ports (Table 11) to operate a container business, the least costly port in comparison to Gulfport shall be established based on port charges only; these data excludes vessel transportation costs in the Gulf of Mexico which should be almost equal for all three ports:

Gulfport Harbor costs: $7,866 x 52 vessel calls (weekly service) - 171,900 short tons = $2.38/ton

Mobile Harbor costs: $11,259 x 52 calls - 171,900 short tons = $3.41/ton

New Orleans (Gulf Outlet) Harbor: $20,455 x 52 calls - 171,900 short tons = $6.19/ton

The incremental costs to use New Orleans or Mobile (instead of Gulfport) are $3.81 and $1.03 per ton, respectively. Therefore, the alternative harbor to Gulfport Harbor is Mobile Harbor.

Scrap Metal (Export). Iron and steel scrap (30,000 tons annually) was expected to be exported through Gulfport Harbor by Goldin Industries, Inc. in the 1976 Feasibility Report. Goldin Industries has grown since then; and in 1986, 224,000 tons of scrap was trucked from all over the Southeastern United States and compacted at their Gulfport facility. It was then trucked to their facility at Biloxi Harbor, moved by barge to Darrow, Louisiana, and placed on 35,000 dwt dry bulk carriers destined for Japan (75%) and Europe (25%). Another 112,000 tons from all over the Southeastern United States is moved by rail directly to Darrow for export on the same vessels.

Alternative transportation modes were considered for the existing 224,000 ton movement from Gulfport to Darrow. The 112,000 tons of precompacted scrap moved by rail to Darrow from the Southeastern U.S. was not priced for an alternative mode since the price would not change. Specifically, the distances from origins to Darrow equal the distances from origins to Gulfport; and there would be no net difference. The rate for trucking the compacted scrap from Goldin Industries' main yard to their barge site on the Harrison County Industrial Seaway was $1.00 per ton for the 224,000 tons of scrap metal; and the barge rate from Biloxi Harbor to Darrow was $3.25 per ton for a total cost of $4.25 per ton. The cost of the same movement by rail was in excess of $8.50 per ton; and by truck was even greater. Therefore, this movement is currently being transported to Darrow, Louisiana, by the cheapest alternative. Regarding

alternative ports, New Orleans and Gulfport are the closest ports with storage facilities to stockpile the scrap metal dockside in the volumes necessary to fully load a 35,000 dwt dry bulk carrier. Fully loading a 35,000 dwt vessel to 36 feet at Darrow with a voyage to Kobe, Japan, costs $23.73 per ton. Lightloading the same vessel to 30 feet at Gulfport for the same trip would cost $29.21 per ton, which validates the efficiency of the present mode(s) of transportation for this movement. In summary, a truck rate to Gulfport Harbor of $2.25 would make the final cost out of Gulfport $31.46 versus $27.98 out of Darrow. (Backhaul rates are included in these voyage costs.)

Summary of Alternative Modes. In all cases, present modes of transportation and choices of ports are the least cost alternatives for the users of the Port of Gulfport.

BASE YEAR AND WITHOUT-PROJECT CONDITION TRANSPORTATION MODES AND UNIT COSTS

Commodities and vessel patterns for 1995 and without-project condition (1995-2045) were analyzed; and transportation costs were calculated on a unit basis for all commodities shown in Table 7.

Ilmenite Ore (Import). Unit costs were calculated for the without-project period (1995-2045) using the data for a 42,000 dwt conbulker shown in Table 9 on a run from Geraldton, Australia, into New Orleans for the offloading of 11,200 tons and then on into Gulfport where an average load of 18,000 tons of ore are offloaded at Gulfport (10,200 short tons of containers are still on the vessel upon leaving Gulfport). In 1995, one-half of this ore will come from Country B in 23,000 dwt dry bulk carriers drawing 34 feet. Without-project condition transportation costs were calculated for the total 260,700 tons of ore to move through New Orleans and then to Gulfport for the period 1995. During the period 1996-2045, the transportation costs were split and computed for 123,200 tons to continue to move through New Orleans (and Gulfport) and the remainder to change origins (Country B) and move directly into Gulfport. Both movements were aggregated for the period 1996-2045, and this stream of transportation costs was discounted to present value and amortized over 50 years at 8 7/8 percent interest rate for average annual equivalent transportation costs for the 260,700 tons of ore over the period 1995-2045. These discounted unit costs were $23.61 per ton.

Unit costs for ore coming from Country C for DuPont's plant expansion (116,800 tons) in 35,000 dwt bulk carriers (see Table 9) were compared to a 30 foot channel at Gulfport under without-project condition (1995-2045), which were computed to be $17.28 per ton. In summary, unit costs for ore are as follows:

TABLE 12
Without-Project Unit Costs for Ilmenite Ore
Gulfport Harbor
(1 October 1989 Prices)
(Project Life 1995-2045)

	30'
260,700 Tons (Countries A & B)	$ 23.61
112,000 Tons (Country C)	17.28[a]

[a]The alternative routing of this vessel is to fully load into Houston, Texas; offload enough ore to meet the 30' draft restriction at Gulfport; and return to Gulfport, which is equal in cost to lightloading directly into Gulfport. (Both were compared to a smaller vessel which would have to make more trips, which is more costly.)

Fresh Fruit (Import). Unit costs were calculated for the without-project condition period for a 13,320 dwt container vessel drafting 28 feet (lightloaded 2 feet) from Puerto Cortez, Honduras to Gulfport. The unit costs were $7.66 under without-project condition. (This vessel will be constructed and in operation by 1995.)

Fishmeal (Import). A unit cost per ton for a 35,000 dwt dry bulk carrier drafting 36 feet (the company's future without-project vessel) lightloaded to 30 feet to/from Chile was calculated and the resulting costs per ton were $11.55 for a 30 foot channel.

Containerized General Cargo (Export and Import). Anticipated traffic under the without-project condition (1995-2045) will be a feeder service from Port Everglades, Florida to Galveston, Texas to Mobile in comparison to the same routing into Gulfport. The per ton costs of the container industry to use Mobile instead of Gulfport are $3.41 based on port costs only (see previous discussion).

Scrap Metal (Export). Under without-project condition, this scrap metal will continue to be barged and railed to Darrow, Louisiana for export through the Port of New Orleans. Therefore, unit costs were developed for this movement through the Port of New Orleans which has a 40-foot channel. A weighted cost per ton (excluding port, handling, and vessel charges) was computed for this tonnage since 75 percent was destined to Japan, 12.5 percent to Spain, and 12.5 percent to Italy. Port depths are greater than 36 feet in Japan and 35 feet each at the ports in Spain and Italy. A 35,000 dwt dry bulk carrier drawing 36 feet was used for the route to Japan and a 30,000 dwt dry bulk carrier

ocean rate for New Orleans to Kobe, Japan, New Orleans to Barcelona, Spain and New Orleans to Genoa, Italy, voyages were $22.60, $15.02 and $14.23 per ton (including backhaul rates) respectively. The weighted rate for the without-project routing through Darrow was $23.44 per ton which included $4.25 per ton for 224,000 tons to be trucked ($1.00) and barged ($3.25) to Darrow. The $23.44 figure was based upon total transportation costs over land and sea.

Summary of Unit Transportation Costs.

A summary of unit costs for base year and without-project condition is presented in Table 13.

TABLE 13
Summary of Unit Transportation Costs at Gulfport
(Without-Project Period 1995-2045)
(1 October 89 Prices)
($ per short ton)

COMMODITY	COSTS
Ilmenite Ore (import)	$ 23.61
Ilmenite Ore (import)	17.28
Scrap Metal (export)	a
Fishmeal (import)	11.55
Fresh Fruit (containers) (import)	7.66
General (containers) (import/export)	b

[a]This is a Gulfport firm which shipped this commodity through Gulfport Harbor until the late 1970's, but was forced to ship through the Port of New Orleans because of lack of channel depth at Gulfport. This traffic will return to Gulfport with a deeper channel. The unit rate for export through New Orleans is $23.44.

[b]The vessel/port charges at Mobile (the least costly alternative to Gulfport) are $3.41 per ton.

WITHOUT-PROJECT CONDITION PROJECTIONS OF COMMERCE

Current data were analyzed to reaffirm trends in growth over the period 1995-2045 for each of the commodities expected to need deep-draft vessels in this analysis. The results of this reanalysis are as follows:

Ilmenite Ore (import): The almost perfect correlation between U.S. earnings in chemical and allied products, total U.S. shipments of paints, varnishes and lacquers and U.S. titanium dioxide production was reaffirmed from the 1976 Feasibility Report and extended to the years 1975 to 1987. The annual growth in titanium dioxide production (the end product of Dupont's Delisle, Mississippi plant) for the period 1975 to 1987 was 3.9 percent annually and was extrapolated to 1995-2045. A 677 percent total growth rate resulted over the without-project period 1995-2045. Since a 30 percent plant expansion is expected to be completed by 1995, a 200 percent growth is claimed herein for this commodity.

Fishmeal (import): BEA Regional Projections, Volume 1, 1985 OBERS, Table 1 showed a 3.3 percent annual growth rate to the year 2035 for the State of Mississippi for food and kindred products, the category for which this fertilizer/feed would be used to produce chickens, catfish and other food products. (Both poultry and catfish production are growth industries in Mississippi.) International Proteins, Inc. officials felt that a 1.4 percent annual growth rate for fishmeal could be supported by the company (200 percent over the period 1995-2045).

Scrap Metal (export): The correlations in the 1976 Feasibility Report between Southeastern U.S. regional consumption of scrap metal to U.S. consumption of scrap metal were found to be valid since the largest population growth sector in the U.S. is the Southeastern states. However, the DRI/TBS World Sea Trade Service model was run for U.S. exports of scrap metal using historical data from 1983 to 1987 with yearly projections to the year 2000. Scrap exports from the U.S. to the world were expected to grow 10.6 percent annually in this model. The largest percents of U.S. exported scrap metal are to Southern Europe, Japan and other Far East countries, the recipients of the scrap metal from this Gulfport, Mississippi firm during the period 1995-2045. Even though the DRI model showed an annual growth rate of 3.9 percent to Southern Europe, 5.8 percent to Japan and 3.5 percent to other Far East countries, the projections in this analysis was held to 2.11 percent annually (284 percent total) over the project life (1995-2045) based upon data from company officials.

General (containers) (import/export): BEA Regional Projections, Volume 1, 1985 OBERS for the State of Mississippi and BEA Regional Projections, Volume 8, Region 5, 1980 for the Southeastern U.S. were examined for growth rates in the manufacturing of non-durable goods which are the most prevalent users of containers. On both a state and regional basis, annual growth rates exceeded 2 percent annually (269 percent over project life). A 1.4 percent annual growth rate (200 percent over project life) was used in this analysis based upon data from company officials.

Fresh Fruit (containers) (imports): Historical U.S. banana imports (3.7 percent annual growth rate) and historical U.S. populations for the period 1975-1986 were used to compute growth in pounds of per capita banana consumption, which has peaked in 1985 at 30 pounds. Historical Southeastern U.S. population growth (1.3 percent annually) was then used to compute the total tons of bananas to be imported into the Southeastern U.S. The Gulfport Harbor tonnage (market share) in 1985-1986 was 25 percent of the Southeastern U.S. total consumption, and this share was assumed to remain constant over the project life. Therefore, a 1.4 percent annual growth rate (200 percent over project life) supplied by company officials was found to be reasonable and was used in this analysis for projecting future without-project conditions.

Table 14 summarizes the projected tonnages for each commodity over this period. (A project life of 1994-2044 is included on this table solely for use in the sensitively analysis at the end of this appendix.)

WITH-PROJECT TONNAGES, UNIT COSTS AND TRANSPORTATION BENEFITS

General. With a deeper channel at Gulfport Harbor, tonnages for some shippers may increase. Unit transportation costs will decrease since larger or more fully loaded vessels will be utilized. These changes from *without-project condition* will be discussed below.

With-Project Tonnages. The tonnages for fresh fruit will remain as presented under without-project condition. The tonnages for the other commodities will increase as follows:

Ilmenite Ore (Import). The barged tonnage from New Orleans to De Lisle via Port Bienville will be transported on the same vessels delivering the existing ore; tonnage will increase to 260,700 tons from Countries A and B and 118,400 from Country C.

Scrap Metal (Export). This commodity will change from New Orleans and will be moved through Gulfport in 1995 (base year); therefore, 365,300 short tons will move through Gulfport with a deeper channel based upon data from company officials.

Fishmeal (Import). Based upon data from company officials (International Proteins, Inc.) this commodity will increase to 42,300 short tons in 1995 with a deeper channel. The inland trucking rates from Gulfport to local farmers would be cheaper than trucking rates from another Gulf of Mexico port to these same farmers. The increased tonnage is from increased demand of catfish farmers in the local area.

TABLE 14
Without-Project Tonnages by Decade for Two Project Lifes
(1994-2044 and 1995-2045)
Gulfport Harbor
(rounded)

	Tonnages for Project Life, 1994-2044						Annual Growth Rate
	1994	2004	2014	2024	2034	2044	
Ilmenite Ore	256,900	291,100	334,600	384,500	441,800	507,700	1.40
Ilmenite Ore	116,800	132,300	152,100	174,800	200,800	230,800	1.40
Scrap Metal	a	a	a	a	a	a	
Fishmeal	41,700	47,300	54,300	62,400	71,700	82,400	1.40
Fresh Fruit (container)	385,400	436,800	502,000	576,900	662,900	761,800	1.40
General (container)	b	b	b	b	b	b	
Total	800,800	907,500	1,043,000	1,198,600	1,377,200	1,582,700	

	Tonnages for Project Life, 1995-2045						Annual Growth Rate
	1995	2005	2015	2025	2035	2045	
Ilmenite Ore	260,700	295,500	339,500	390,200	448,400	515,200	1.40
Ilmenite Ore	118,400	134,200	154,200	177,200	203,600	234,000	1.40
Scrap Metal	a	a	a	a	a	a	
Fishmeal	42,300	47,900	55,100	63,300	72,700	83,600	1.40
Fresh Fruit (container)	390,800	442,900	509,000	584,900	672,200	772,400	1.40
General (container)	b	b	b	b	b	b	
Total	812,200	920,500	1,057,800	1,215,600	1,396,900	1,605,200	

[a]This is a Gulfport firm which shipped this commodity through Gulfport Harbor until the late 1970's, but was forced to ship through the Port of New Orleans because of lack of channel depth at Gulfport. This traffic will return to Gulfport with a deeper channel.

[b]This tonnage will remain at Mobile under without-project condition, but will return to Gulfport with a deeper channel.

General Containers (Export/Import). The tonnage which diverted to Mobile will return to Gulfport because of the lesser vessel/port charges (181,700 tons).

In summary, with-project tonnages are presented in Table 15 by decade. Annual growth rates in tonnages over the project life are also shown. A 1994-2044 project life is also shown on Table 15, which will be used for a sensitivity analysis at the end of this appendix. This sensitivity analysis is provided because the completion date of the project is uncertain.

With-Project Unit Costs. With a deeper channel, all commodities will move in larger and/or more fully loaded vessels. The process of computing the unit costs for each commodity is described below:

Ilmenite Ore (Import). Average annual transportation cost was computed for ore under the same process and in the same vessels as under without-project condition for 32', 34' and 36' channels at Gulfport. These unit costs were $20.84, $19.45 and $18.76, respectively, for the ore coming from Australia and County B.

Unit costs for ore coming from Country C were also calculated using the same vessels under without-project condition. For 32', 34' and 36' channels at Gulfport, these unit costs were $15.62, $14.26 and $13.11, respectively.

Scrap Metal (Export). The overland modes of transportation and ports would change for this commodity with a deeper channel at Gulfport. Eliminating the barging to Darrow, Louisiana and substituting trucking the 224,000 tons to the Port of Gulfport at $2.25 per ton, and then routing the scrap in the same vessels to the same destinations with the same weighting process as presented under without-project condition resulted in costs of $24.97, $23.01 and $21.42 for 32, 34, and 36 foot channels at Gulfport, respectively. (No underkeel clearance for vessel operation was used at Gulfport in this analysis.)

Fishmeal (Import). The without-project condition vessel was more fully loaded with a 32', 34' and 36' channel at Gulfport. The resulting costs per ton were $10.43, $9.52 and $8.76, respectively, with the aforementioned channel depths.

Fresh Fruit (Import). The same without-project condition vessel and trip was used to calculate unit costs for a 32', 34' and 36' channel at Gulfport. These unit costs were $6.91 for all three different channel depths, since the vessel would be fully loaded at 32 feet (30' loaded draft plus 2 feet underkeel clearance).

TABLE 15
With-Project Tonnages by Decade for Two Project Lifes
(1994-2044 and 1995-2045)
Gulfport Harbor
(rounded)

	Tonnages for Project Life, 1994-2044						Annual Growth Rate
	1994	2004	2014	2024	2034	2044	
Ilmenite Ore	256,900	291,100	334,600	384,500	441,800	507,700	1.40
Ilmenite Ore	116,800	132,300	152,100	174,800	200,800	230,800	1.40
Scrap Metal	357,700	431,700	531,900	655,400	807,600	995,200	2.11
Fishmeal	41,700	47,300	54,300	62,400	71,700	82,400	1.40
Fresh Fruit (container)	385,400	436,800	502,000	576,900	662,900	761,800	1.40
General (container)	179,200	203,100	233,400	268,200	308,200	354,200	1.40
Total	1,337,700	1,542,300	1,808,300	2,122,200	2,493,000	2,932,100	

	Tonnages for Project Life, 1995-2045						Annual Growth Rate
	1995	2005	2015	2025	2035	2045	
Ilmenite Ore	260,700	295,500	339,500	390,200	448,400	515,200	1.40
Ilmenite Ore	118,400	134,200	154,200	177,200	203,600	234,000	1.40
Scrap Metal	365,300	440,800	543,100	669,300	824,700	1,016,200	2.11
Fishmeal	42,300	47,900	55,100	63,300	72,700	83,600	1.40
Fresh Fruit (container)	390,800	442,900	509,000	584,900	672,200	772,400	1.40
General (container)	181,700	206,000	236,700	272,000	312,500	359,200	1.40
Total	1,359,200	1,567,300	1,837,600	2,156,900	2,534,100	2,980,600	

Containerized General Cargo (Export/Import). Based on port/harbor charges in Table 11 and the previous analysis of identifying the alternative port to Gulfport, the port/harbor charges at Gulfport Harbor are $2.38 per ton (see page 21).

Summary. Table 16 displays the unit transportation costs and savings for each commodity by channel depth.

ECONOMIC BENEFITS

Methodology

The transportation benefits resulting from a deeper channel at Gulfport Harbor are generated by more efficient utilization (greater loadings) of vessels presently calling at the port, reduced vessel transit times and port times, and other benefit categories which include reduced port handling charges, reduced pilotage fees, etc. Benefits are computed as the difference in transportation costs between the without-project Condition and with-project condition. All future benefits are discounted to their present value and then amortized over the project life (1995-2045) at the FY 1990 interest rate of 8-7/8%. Transportation costs and/or data are based upon Department of Army Economic Guidance Memorandum Number 89-5, dated 15 September 1989 (vessel immersion factors and drafts were used from Department of the Army Engineering Circular 1105-2-190, dated 24 August 1988). For this analysis, all vessel capacities, commerce/tonnages, etc. have been converted to short tons.

TABLE 16
Summary of Unit Transportation Costs and Savings
for Various Considered Depths at Gulfport
(Project Life 1995-2045)
(1 October 1989 Prices)

	COSTS PER TON ($)			
COMMODITY	WITHOUT-PROJECT 30'	WITH-PROJECT 32'	34'	36'
Ilmenite ore	23.61	20.84	19.45	18.76
Ilmenite ore	17.28	15.62	14.26	13.11
Scrap metal	23.44	24.97	23.01	21.42
Fishmeal	11.55	10.43	9.52	8.76
Fresh fruit (containers)	7.66	6.91	6.91	6.91
General (containers)	3.41	2.38	2.38	2.38

		SAVINGS PER TON ($)		
		32'	34'	36'
Ilmenite ore	----	2.77	4.16	4.85
Ilmenite ore	----	1.66	3.02	4.17
Scrap metal	----	0	0.43	2.02
Fishmeal	----	1.12	2.03	2.79
Fresh fruit (containers)	----	0.75	0.75	0.75
General	----	1.03	1.03	1.03

Benefits to a Deeper Channel

With a deeper channel at Gulfport, transportation benefits accrue to shippers who will import and export commodities through the Port of Gulfport under the without and with-project conditions. Base year traffic volumes and corresponding benefits that would be realized from considered improvements at Gulfport Harbor are presented in Table 17 and are showr here solely for the purpose of displaying a "no growth" scenario. Base Year volume is 1,359,000 tons (see Table 15); and base year savings for channel depths 32, 34 and 36 feet are $1,446,300, $2,165,400 and $3,094,300, respectively. These benefits are generated by multiplying the 1995 tonnage by the savings per ton in Table 16.

TABLE 17
Base Year Tonnage and Benefits
Gulfport Harbor
(1 October 1989 Prices)
(Rounded)

	1995 Tonnage (tons)	1995 Benefits ($)		
		32'	34'	36'
Ilmenite Ore	260,700	$722,100	$1,084,500	$1,264,400
Ilmenite Ore	118,400	196,500	357,600	493,700
Scrap Metal	365,300	0	157,100	737,900
Fishmeal	42,300	47,400	85,900	118,000
Fresh Fruit (container)	390,800	293,100	293,100	293,100
General (container)	181,700	187,200	187,200	187,200
Totals	1,359,200	$1,446,300	$2,165,400	$3,094,300

Table 18 displays the transportation savings for the commodities and their tonnages which will move through Gulfport with alternative channel depth increases. These savings are generated by the differences in costs per ton in Table 16 for each successively deeper channel from the costs per ton for a 30-foot channel. These benefits, by commodity and by channel depth, are converted to an average annual equivalent basis in Table 19 by discounting future benefits to present worth and then amortizing the benefits over the project life at 8-7/8 percent interest.

TABLE 18
Transportation Benefits for Alternative Channel Depths
Gulfport Harbor/Project Life 1995-2045
(1 October 1989 Prices)
(Rounded $)

	1995	2005	2015	2025	2035	2045
			32 Foot Channel			
Ilmenite ore	$722,100	$818,500	$940,400	$1,080,900	$1,242,100	$1,427,100
Ilmenite ore	196,500	222,800	256,000	294,200	338,000	388,400
Scrap metal	0	0	0	0	0	0
Fishmeal	47,400	53,600	61,700	70,900	81,400	93,600
Fresh fruit (containers)	293,100	332,200	381,800	438,700	504,200	579,300
General (containers)	187,200	212,200	243,800	280,200	321,900	370,000
TOTALS	$1,446,300	$1,639,300	$1,883,700	$2,164,900	$2,487,600	$2,858,400
			34 Foot Channel			
Ilmenite ore	$1,084,500	$1,229,300	$1,412,300	$1,623,200	$1,865,300	$2,143,200
Ilmenite ore	357,600	405,300	465,700	535,100	614,900	706,700
Scrap metal	157,100	189,500	233,500	287,800	354,600	437,000
Fishmeal	85,900	97,200	111,900	128,500	147,600	169,700
Fresh fruit (containers)	293,100	332,200	381,800	438,700	504,200	579,300
General (containers)	187,200	212,200	243,800	280,200	321,900	370,000
TOTALS	$2,165,400	$2,465,700	$2,849,000	$3,293,500	$3,808,500	$4,405,900
			36 Foot Channel			
Ilmenite ore	$1,264,400	$1,433,200	$1,646,600	$1,892,500	$2,174,700	$2,498,700
Ilmenite ore	493,700	559,600	643,000	738,900	849,000	975,800
Scrap metal	737,900	890,400	1,097,100	1,352,000	1,665,900	2,052,700
Fishmeal	118,000	133,600	153,700	176,600	202,800	233,200
Fresh fruit (containers)	293,100	332,200	381,800	438,700	504,200	579,300
General (containers)	187,200	212,200	243,800	280,200	321,900	370,000
TOTALS	$3,094,300	$3,561,200	$4,166,000	$4,878,900	$5,718,500	$6,709,700

TABLE 19
Average Annual Equivalent Transportation Benefits
Gulfport Harbor
(1 October 1989 Prices, 8 7/8%, $1,000)

	Project Life of 1995-2045		
	32'	34'	36'
Ilmenite Ore	$ 856.2	$1,258.8	$1,476.6
Ilmenite Ore	228.1	415.1	573.1
Scrap Metal	0	198.3	931.5
Fishmeal	55.0	99.6	136.9
Fresh Fruit (containers)	340.2	340.2	340.2
General (containers)	217.3	217.3	217.3
Totals	$1,696.8	$2,529.3	$3,666.6

Benefits to a Wider Channel

Since almost all the transportation benefits are generated by more fully loading the existing vessels calling at the port, few benefits for extra width could be generated from port and pilot data on vessel speeds (transits) on the straight part of the channel. Specifically, these larger ships have incurred navigational problems at three bends, which will be discussed in later paragraphs, but have incurred minor delays in the straight parts of the channel. Therefore, there are no benefits to channel widening in this analysis.

Other Benefits

The three Navy oceanographic vessels are 21,235 dwt research vessels with dimensions 535.7' x 76' x 29.8'. The hydrographic sonar array on each vessel bottom protrudes an additional 2.5 feet, and NOC requires another 2 feet of underkeel clearance for the safety of this $12.0 million piece of equipment. These vessels presently come into New Orleans for resupply and crew liberty. Each trip requires one full day extra each way and 6 hours awaiting daylight to enter or exit the New Orleans channel because of floating objects in the Lower Mississippi River. Vessel operating costs were furnished by NOC. These vessels would be serviced at Gulfport with a 34 or 36 foot channel with a savings of $253,125 annually (1.5 trips annually x 2.25 days at New Orleans x $25,000/day x 3 vessels). This amount does not include a savings in the overland costs of crews and supply teams to resupply these vessels at Gulfport versus New Orleans.

The ABC Containerline vessels mentioned above, which transport the ilmenite ore for DuPont, also transport containers each trip. Annually, 3,000 containers are offloaded at New Orleans to lighten the vessel for entering Gulfport Harbor. These 3,000 containers would be transferred to the Port of Gulfport with a deeper channel. The savings shown here result from the difference in handling charges at the two ports and amount to $50 per container or $150,000 annually based on data from ABC Containerlines officials (3 separate ILA contracts at New Orleans account for the difference). This benefit would accrue to both a 34 and 36-foot channel.

During the winter months (1 November to 1 April) reduced depths caused by strong northerly winds result in vessel delays. Port officials report that at least five of the larger vessels per month during this period are delayed one hour each way awaiting high tide, which mounts to $16,250 annually (5 months x 5 vessels/mo x 1 hr x $650 average per hour). Other transportation losses occur at three bends in the entrance channel. The westward migration of Ship Island has forced a bend to the west near the midpoint of Ship Island Pass and, in turn, this realignment has progressively tightened the bend at the northern end of the pass. Based on data from port officials and harbor pilots, all vessels are delayed an average of 15 minutes each way because of these bends (speed reductions from 10 knots to 4.5 knots over this five mile area of bends), which results in a loss of $98,750 annually (395 vessels x 30 minutes x $500 average hourly cost). In addition, 40 percent of the larger vessels (particularly RoRo's and container vessels with extensive freeboard) are delayed an extra 15 minutes each way during the winter months because high northerly winds complicate maneuvering in these bends, especially the northernmost (2.25 hours in winter versus 2.0 hours in summer for channel travel time one way based on pilots' logs). These additional delays result in losses of $17,875 annually (55 vessels x 30 min. x $650 average at sea hourly operating costs). Two vessel groundings in the Spring of 1987 could have been avoided if these bends were eased. Additional widening for these bends would result in savings of $116,625 annually.

Turning Basin Benefits

The turning basin entry area has a large wedge of fill material which extends approximately one-third the distance into the turning area. See the Main Report for a graphic illustration. This wedge of material causes delays of the vessel and their harbor tugs in travel time from the most southern tip of this wedge into the harbor and also restricts the turning of vessels while other vessels are docked. Table 20 displays the without-project travel/turning costs of each of these vessels based on a consensus of the harbor pilots experiences. A cruise

ship was added to the harbor in early 1989 which has added delays to the port call of some of the vessels. These delays are described in the last part of Table 20 for without-project condition. It should be noted that removal of a portion of this wedge for containeryard and expansion by the port during without-project condition will not allow the vessels/tugs to transit or turn as indicated under with-project condition (the breakwater jetties and inconsistent dredging spots/depths will remain in this wedge). The entire wedge must be removed to realize the benefit shown.

Table 21 describes the with-project condition (the wedge of fill material removed) for the turning basin; e.g., reduced vessels and tugs travel/transit times and reduced delays will occur. Specifically, removal of this wedge creates a "second" turning area for vessels using the southernmost piers on the west side of the harbor (ore and container vessels), which will also create less congestion in the uppermost turning area. The benefits to removal of this wedge from the turning basin area are summarized and displayed in Table 22 below:

Table 22
Summary - Turning Basin Benefits
Gulfport Harbor
(1 October 1989 Prices)

	Costs		
	Without-Project	With-Project	Benefits
Vessels/Tugs Travel/ Turning Time Reductions	$2,796,000	$2,170,400	$ 625,700
Vessel Delays	108,700	0	108,700
TOTALS	$2,904,700	$2,170,400	$ 734,400

TABLE 20
TURNING BASIN INCREMENTAL ANALYSIS
(1 October 1989 Prices)

Gulfport Harbor					GULFPORT HARBOR											
					WITHOUT-PROJECT ANNUAL COSTS											
					Travel/Turning Costs								Delay Costs			
					Vessels		Tugs									
I. Dest Side	Turns Per Trip	Sailing Practices	Number Vessels /Year	Vessel Costs At Sea (Per Hour)	Hours	R/T Costs	Number	Hrs	Cost/ Tug Trip	R/T Costs	Vessel And Tug R/T Costs	Total Annual Costs	Vessel $ In port (Per Hour)	Total Trips Delayed	Hours Delayed	R/T Delay Costs	Total Annual Costs
a) Ore																	
1) 42,000 dwt DBC	2	DO	24	$953	1.75	$3,336[a]	2	1.50	$1,715[b]	$3,431[c]	$6,766[d]	$162,391[e]	$588	24	0.75	$882[g]	$21,168[h]
2) 35,000 dwt DBC	2	DO	24	$535	1.75	$1,873	2	1.50	$1,715	$3,431	$5,303	$127,279	$394	24	0.75	$591	$14,184
b) Container	2	DO	52	$827	1.75	$2,895	2	1.50	$1,715	$3,431	$6,325	$328,916	$544	52	0.75	$816	$42,432
c) Fish Meal																	
1) Ships	1	DO	4	$535	1.75	$1,873	2	1.50	$1,603	$3,206	$5,078	$20,313	$394	0	0.00	$0	$0
2) Barge (tows)	1	D/N	8	$245	1.00	$490	-	-	-	-	-	-	$245	0	-	-	-
d) Bananas (Chiquitta) - shift	1	DO	5	$544	1.00	$1,088	1	1.00	$1,513	$1,513	$2,601	$13,005	$389	5	0.75	$584	$2,918
Bananas (Chiquitta)	1	DO	64	$544	1.00	$1,088	1	1.00	$1,513	$1,513	$2,601	$166,458	$389	6.4	1.50	$1,167	$7,469
e) General Cargo	1	D/N	30	$502	1.00	$1,004	1	1.00	$1,513	$1,513	$2,517	$75,507	$334	0	0.00	$0	$0
f) Bananas (Dole) - shift	1	DO	8	$544	1.00	$1,088	1	1.00	$1,513	$1,513	$2,601	$20,807	$389	8	0.75	$584	$4,668
g) Other (barge)	1	D/N	24	$245	0.00	-	-	-	-	-	-	-	$245	0	-	-	-
(Ocean Barges)	1	DO	18	$440	1.75	$1,540	2	1.50	$1,603	$3,206	$4,746	$85,424	$342	0	0.00	$0	$0
II. East Side																	
a) Bananas (Dole)	1	DO	64	$544	1.00	$1,088	1	1.00	$1,513	$1,513	$2,601	$166,458	$389	6.4	1.50	$1,167	$7,469
b) Cruise Ship(s)	1	D/N	468	$495	1.50	$1,485	1	1.50	$1,603	$1,603	$3,088	$1,445,137	$350	12.6	0.50	$350	$4,410
c) Coast Guard Cutter	1	D/N	24	-	1.00	-	-	-	-	-	-	-	-	-	-	-	-
d) Lumber/Poles	1	DO	24	$515	1.75	$1,803	2	1.50	$1,603	$3,206	$5,008	$120,199	$389	1.7	1.50	$1,167	$1,984
e) Scrap Metal	1	DO	12	$535	2.00	$2,140	2	1.50	$1,603	$3,206	$5,346	$64,150	$394	1.7	1.50	$1,182	$2,009
Total			853			$22,789				$32,283		$2,796,044					$108,710

Notes: "Do" = Daylight Only; "D/N" = Day and Night; "R/T" = Round Trip

[a] $953 x 1.75 x 2 = $3,336
[b] A 1.5 hour tug use is $1,715 for both exit and entry of the vessel.
[c] $1,715 x 2 tugs = $3,431
[d] $3,336 + $3,431 = $6,766
[e] $6,766 x 24 vessel trips = $162,391
[f] Hours delayed per exit/entry were based on an analysis of occupancy rate for each berth separately and combined, and hours of operational patterns of each type of berth usage and all vessel turning patterns; and resulting probabilities were used to calculate the actual delays.
[g] $588 x 0.75 x 2 = $882
[h] $882 x 24 trips delayed = $21,168

TABLE 21
TURNING BASIN INCREMENTAL ANALYSIS
(1 October 1989 Prices)

GULFPORT HARBOR

Gulfport Harbor					WITH-PROJECT ANNUAL COSTS											
					Travel/Turning Costs								Delay Costs			
					Vessels		Tugs									
I. West Side	Turns Per Trip	Sailing Practices	Number Vessels /Year	Vessel Costs At Sea (Per Hour)	Hours	R/T Costs	Number	Hrs	Cost/ Tug Trip	R/T Costs	Vessel And Tug R/T Costs	Total Annual Costs	Vessel $ In port (Per Hour)	Total Trips Delayed	Hours Delayed	R/T Delay Costs	Total Annual Costs
a) Ore																	
1) 42,000 dwt DBC	2	BO	24	$953	0.50	$953	2	0.50	$1,513	$3,026	$3,979	$95,491	$588	24	0	$0	$0
2) 35,000 dwt BBC	2	BO	24	$535	0.50	$535	2	0.50	$1,513	$3,026	$3,561	$85,459	$394	24	0	$0	$0
b) Container	2	BO	52	$827	0.50	$827	2	0.50	$1,513	$3,026	$3,853	$200,346	$544	52	0	$0	$0
c) Fish Meal																	
1) Ships	1	BO	4	$535	0.50	$535	2	0.75	$1,513	$3,026	$3,561	$14,243	$394	0	0	$0	$0
2) Barges (2 barge tow)	1	B/N	8	$245	0.50	$245	-	-	-	-	-	-	$245	0	-	-	-
d) Bananas (Chiquitta) - shift	1	BO	5	$544	0.75	$816	1	0.75	$1,513	$1,513	$2,329	$11,645	$389	5	0	$0	$0
Bananas (Chiquitta)	1	BO	64	$544	0.75	$816	1	0.75	$1,513	$1,513	$2,329	$149,050	$389	6.4	0	$0	$0
e) General Cargo	1	B/N	30	$502	0.50	$502	1	0.50	$1,513	$1,513	$2,015	$60,447	$334	0	0	$0	$0
f) Bananas (Bole) - shift	1	BO	8	$544	0.75	$816	1	0.75	$1,513	$1,513	$2,329	$18,631	$389	8	0	$0	$0
g) Other (barge)	1	B/N	24	$245	0.00	-	-	-	-	-	-	-	$245	0	-	-	-
(Ocean Barges)	1	BO	18	$440	0.50	$440	2	0.50	$1,513	$3,026	$3,466	$62,384	$342	0	0	$0	$0
II. East Side																	
a) Bananas (Bole)	1	BO	64	$544	0.75	$816	1	0.75	$1,513	$1,513	$2,329	$149,050	$389	6.4	0	$0	$0
b) Cruise Ship(s)	1	B/N	468	$495	1.00	$990	1	1.00	$1,513	$1,513	$2,503	$1,171,357	$350	12.6	0	$0	$0
c) Coast Guard Cutter	1	B/N	24	-	1.00	-	-	-	-	-	-	-	-	0	-	-	-
d) Lumber/Poles	1	BO	24	$515	1.00	$1,030	2	1.25	$1,549	$3,098	$4,128	$99,067	$389	1.7	0	$0	$0
e) Scrap Metal	1	BO	12	$535	1.25	$1,338	2	1.25	$1,549	$3,098	$4,435	$53,224	$394	1.7	0	$0	$0
Total			853			$10,659				$30,402		$2,170,394					$0

Note: See Table 20 for all notes and footnotes.

Summary of Benefits

Table 23 lists the transportation benefits and other benefits generated from reduced vessel transit times, reduced vessel delays (awaiting high tides), and a new turning basin.

SENSITIVITY ANALYSIS

The benefits shown above are based on construction of this project being completed 1 March 1995 (project life of 1995-2045). Should project construction be completed by 1 March 1994, a project life of 1994-2044 would generate slightly fewer average annual equivalent benefits to the project. The lower benefits were generated by less growth in tonnage over the project life (see Table 15 again), even though slightly higher savings per ton resulted from the ilmenite ore from Australia. No other commodity in this analysis showed differences in savings per ton between the two project lifes. See Table 24 for a summary of the costs and savings per ton for the 1994-2044 project life. Table 25 displays the transportation savings by decade for a project life of 1994-2044. Table 26 is a summary of all the benefit categories. No changes will occur in any other category of benefits (bend widening, vessel delays or the turning basin). In summary, the total average annual equivalent benefits for a 1994-2044 project life are $2,500,000, $3,777,000 and $5,280,400, respectively, for 32', 34' and 36' channels.

The final transportation benefits are sensitive to the hourly vessel operating costs, which usually fluctuate because of diesel fuel and/or crew costs. These latter two items were comparatively low in the 1 October 1989 guidance used in this analysis. This district anticipates revised (and higher) hourly vessel operating costs by March, 1990. The final benefits could be increased as much as 25 percent.

TABLE 23
Summary of Annual Benefits at Gulfport Harbor
(1 October 1989 Prices, 8 7/8%)
($1,000)

	(Project Life of 1995-2045) Channel Depths		
	32'	34'	36'
TRANSPORTATION BENEFITS			
Depth Related			
Better Vessel Utilization	$1,696.8	$2,529.3	$3,666.6[a]
Other Benefits:			
(a) Reduction of Transit Times (Naval Hydrographic Sonar Vessels)	0	253.1	253.1
(b) Reduced Vessel Delays (Awaiting high tide)	0	16.2	16.2
(c) Reduced Port Handling Charges on 3,000 containers	0	150.0[b]	150.0[b]
Bend related			
Reduced Vessel Transit Times Due to Widening 3 Bends	98.8	116.6	116.6
Turning Basin Improvements	734.4	734.4	734.4
TOTALS	$2,530.0	$3,799.6	$4,936.9

[a]There are no additional benefits to a 38' channel; the conbulkers transporting ore from Australia with containers aboard are "fully loaded" at 36'.

[b]No changes occurred in these handing charges at New Orleans.

TABLE 24
Summary of Unit Transportation Costs and Savings
for Various Considered Depths at Gulfport
(Project Life 1994-2044)
(1 October 1989 Prices)

	COSTS PER TON ($)			
COMMODITY	WITHOUT-PROJECT 30'	WITH-PROJECT 32'	34'	36'
Ilmenite ore	23.50	20.69	19.29	18.56
Ilmenite ore	17.28	15.62	14.26	13.11
Scrap metal	23.44	24.97	23.01	21.42
Fishmeal	11.55	10.43	9.52	8.76
Fresh fruit (containers)	7.66	6.91	6.91	6.91
General (containers)	3.41	2.38	2.38	2.38

	SAVINGS PER TON ($)		
	32'	34'	36'
Ilmenite ore	2.81	4.21	4.94
Ilmenite ore	1.66	3.02	4.17
Scrap metal	0	0.43	2.02
Fishmeal	1.12	2.03	2.79
Fresh fruit (containers)	0.75	0.75	0.75
General	1.03	1.03	1.03

TABLE 25
Transportation Benefits for Alternative Channel Depths
Gulfport Harbor/Project Life 1994-2044
(1 October 1989 Prices)
(Rounded)

	1994	2004	2014	2024	2034	2044
			32 Foot Channel			
Ilmenite ore	$721,900	$818,000	$940,200	$1,080,400	$1,241,500	$1,426,600
Ilmenite ore	193,900	219,600	252,500	290,200	333,300	383,100
Scrap metal	0	0	0	0	0	0
Fishmeal	46,700	53,000	60,800	69,900	80,300	92,300
Fresh fruit (containers)	289,100	327,600	376,500	432,700	497,200	571,400
General (containers)	184,600	209,200	240,400	276,200	317,400	364,800
TOTALS	$1,436,200	$1,627,400	$1,870,400	$2,149,400	$2,469,700	$2,838,200
			34 Foot Channel			
Ilmenite ore	$1,081,500	$1,225,500	$1,408,700	$1,618,700	$1,860,000	$2,137,400
Ilmenite ore	352,700	399,500	459,300	527,900	606,400	697,000
Scrap metal	153,800	185,600	228,700	281,800	347,300	427,900
Fishmeal	84,700	96,000	110,200	126,700	145,600	167,300
Fresh fruit (containers)	289,100	327,600	376,500	432,700	497,200	571,400
General (containers)	184,600	209,200	240,400	276,200	317,400	364,800
TOTALS	$2,146,400	$2,443,400	$2,823,800	$3,264,000	$3,773,900	$4,365,800
			36 Foot Channel			
Ilmenite ore	$1,269,100	$1,438,000	$1,652,900	$1,899,400	$2,182,500	$2,508,000
Ilmenite ore	487,100	551,700	634,300	728,900	837,300	962,400
Scrap metal	722,600	872,000	1,074,400	1,323,900	1,631,400	2,010,300
Fishmeal	116,300	132,000	151,500	174,100	200,000	229,900
Fresh fruit (containers)	289,100	327,600	376,500	432,700	497,200	571,400
General (containers)	184,600	209,200	240,400	276,200	317,400	364,800
TOTALS	$3,068,800	$3,530,500	$4,130,000	$4,835,200	$5,665,800	$6,646,800

TABLE 26
Summary of Annual Benefits at Gulfport Harbor
(Project Life 1994-2044)
(1 October 1989 Prices, 8 7/8 % Interest)
($1,000)

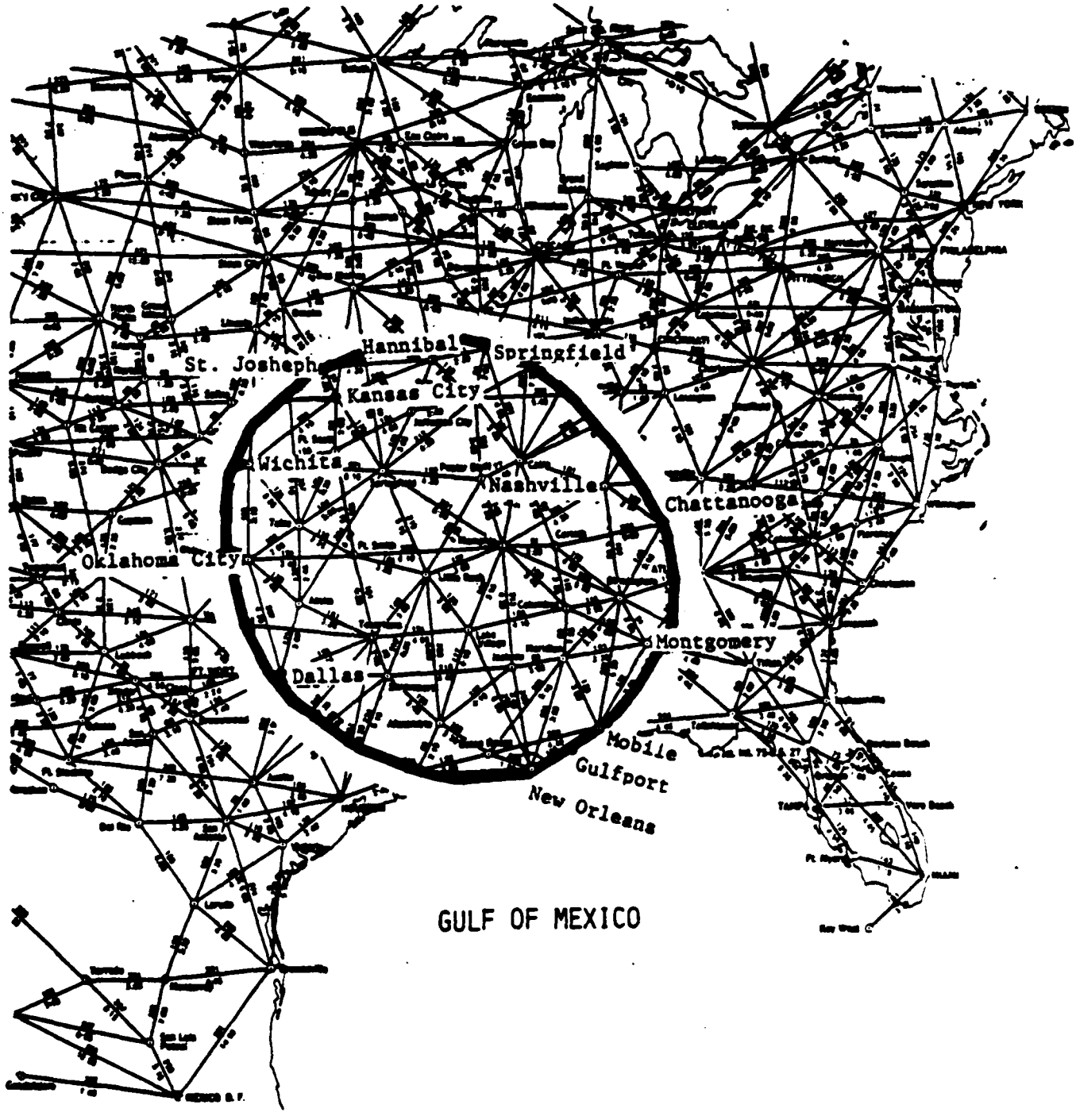
	Project Life 1994-2044		
TRANSPORTATION BENEFITS:	32'	34'	36'
Depth Related:			
Better Vessel Utilization	$1,666.8	$2,506.7	$3,635.1
Other Benefits:			
(a) Reduction of Transit Times (Naval Hydrographic Sonar Vessels)	0	253.1	253.1
(b) Reduced Vessel Delays (Awaiting high tide)	0	16.2	16.2
(c) Reduced Port Handing Charges on 3,000 Containers	0	150.0[a]	150.0[a]
Bend Related			
Reduced Vessel Transit Times due to Widening 3 Bends	98.8	116.6	116.6
Turning Basin Improvements	734.4	734.4	734.4
TOTALS	$2,500.0	$3,777.0	$4,905.4

[a]No changes occurred in costs for handling containers at New Orleans over the period 1986 to 1989.

MULTIPORT ANALYSIS

The only commodities which would be a transfer from another port are 3,000 containers (60,000 short tons) annually from Australia on the ilmenite ore vessels which first call at New Orleans. This tonnage represents a 1.67 percent loss of the total 1986 container trade for the Port of New Orleans.[17] The savings to each container is represented by a $50 higher handling charge at New Orleans than Gulfport. Since these vessels will come directly to Gulfport because of the ore under with-project conditions, the loss of these accompanying containers to New Orleans is negligible.

The general containers (TFL traffic) which were coming into Gulfport under existing condition, were shifted to Mobile under without-project in this analysis, but will return to Gulfport under with-project condition because of the savings shown in previous paragraphs. The attraction of the scrap metal movement to the Port of Gulfport represents a real savings to the Gulfport firm which brokers the scrap to Japan and Europe. Excessive costs which are incurred by Goldin Industries, Inc. because of lack of channel depth at Gulfport will be saved by moving the product through Gulfport.



Tributary Area - Port of Gulfport

Plate A-1

ENDNOTES

[1] Channel Deepening for Navigation, Gulfport Harbor, Gulfport, MS: Feasibility Report, Nov. 1976, US Army Corps of Engineers, Mobile District, pp. F-1 through F-52.

[2] City and County Data Book, 1952, 1967, 1977 and 1983, US Dept. of Commerce, Bureau of the Census.

[3] Census of Population and Housing, 1980: Summary Tape File 14 (Microfiche), US Dept of Commerce, Bureau of the Census.

[4] County and City Data Book, 1983, US Dept. of Commerce, Bureau of the Census.

[5] Ibid.

[6] Waterborne Commerce of the United States, 1980-1984, Part 2 (Gulf Coast, Mississippi River System and Antilles); Dept. of the Army, Corps of Engineers.

[7] Ibid.

[8] Channel Deepening for Navigation, Gulfport Harbor, Gulfport Ms: Feasibility Report, Nov 1976, Op.cit., pp. F-10 - F-12.

[9] Ibid.

[10] Based upon conversation with ABC Containerlines Manger of Worldwide Operations, Antwerp, Belgium, 19 December 1985.

[11] Based upon correspondence from DuPont Headquarters, Wilmington, Delaware, 1986 and 1987.

[12] Ibid.

[13] Channel Deepening for Navigation, Gulfport Harbor, Gulfport MS: Feasibility Report, Nov 1976, Op.cit., pp. F-9 - F-13

[14] Op.cit. p. F-15

[15] Engineering Circular 1105-2-167, dated 25 July 1986 and Supplemental Vessel Operating Costs Estimates dated 27 February 1987.

[16] Merchant Fleet Forecast of Vessels in US-Foreign Trade, May, 1978, Temple, Barker & Sloan, Inc. Management and Economic Counsel, Wellesley Hills, Massachusetts, under contract for US Department of Commerce, Maritime Administration.

[17] The Weekly Bulletin, Port of New Orleans, December 1986 Monthly Statistical Report, p.8.